



# Ground Fault Interrupter

## Description

The CS294 is an AC outlet ground fault interrupter controller IC. The IC detects the presence of hazardous grounding conditions and open circuits the AC line before a dangerous shock can occur.

The CS294 contains an operational amplifier, an SCR driver and a 24V zener shunt regulator. Two sense coils, a bridge rectifier, a relay and

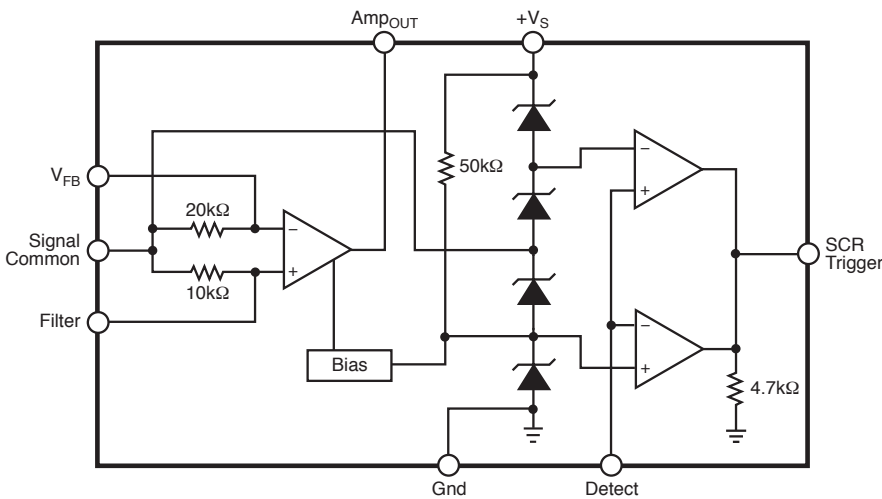
an SCR are required as external components. The completed interrupter circuit can detect and protect against both hot wire to ground faults and neutral wire to ground faults.

The CS294 is built on a 30V bipolar process and is available in 8 lead DIP packages.

## Features

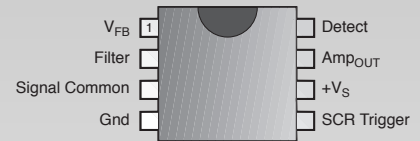
- Supply Derived from AC Supply — 24V
- Direct Interface to SCR
- Adjustable Sensitivity
- Grounded Neutral Fault Detection

## Block Diagram



## Package Options

8 Lead PDIP & SO Narrow



## Absolute Maximum Ratings

Operating Junction Temperature, $T_J$ .....	150°C
Lead Temperature Soldering:	
Wave Solder (through hole styles only) .....	10 Sec. max 260°C Peak
Reflow (SMD styles only) .....	60 sec. max above 183°C, 230° peak
Storage Temperature Range, $T_S$ .....	-65°C to 150°C

Pin Symbol	Pin Name	$V_{MAX}$	$V_{MIN}$	$I_{SOURCE}$	$I_{SINK}$
$V_{FB}$	Error Amp Inverting Input	30V	-0.3V	N/A	20mA
Filter	Error Amp Non-Inverting Input	30V	-0.3V	1mA	1mA
Signal Common	Signal Reference Input	$V(+V_S) + 1V$	$V(+V_S) - 1V$	1ma	1ma
Gnd	Power Supply Return	0V	0V	1mA	10mA
SCR Trigger	SCR Driver Output	30V	-0.3V	1mA	1mA
$+V_S$	Shunt Regulator Supply Input	30V	-0.3V	1mA	1mA
Amp <sub>OUT</sub>	Error Amp Output	30V	-0.3V	1mA	1mA
Detect	Ground Fault Detect Input	6V	-0.3V	10mA	10mA

Electrical Characteristics:  $T_A = 25^\circ\text{C}$ .

For ease of testing and improved test accuracy, Signal Common is grounded and a negative voltage is applied to the Gnd pin.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	$+V_S$			1.2	mA
Negative Supply Voltage Clamp		-14.1	-11.9	-9.7	V
Positive Supply Voltage Clamp		9.7	11.9	14.1	V
Output Offset Voltage		-400	67	+1100	mV
Output Resistance	$I(\text{SCR Trigger}) = 100\mu\text{A}$	2.89	4.70	6.78	k $\Omega$
Negative Amp Output Swing			-10.95	-8.5	V
Positive Amp Output Swing		8.5	11.5		V
Positive Detect Threshold		5.9	6.5	7.2	V
Negative Detect Threshold		-7.2	-6.5	-5.9	V
Detect Leakage Current	$V(\text{SCR Trigger}) = 0V$		0.5	5.0	$\mu\text{A}$
Amplifier Open Loop Gain	$V(V_{FB}) = 1\text{mV RMS @ } 50\text{kHz}$	20	90		V/V
Operating Temperature Range $T_A$ (Note 1)		0		70	°C

Note 1: Guaranteed by design.

### Package Pin Description

PACKAGE PIN #	PIN SYMBOL	FUNCTION
<b>8 Lead PDIP</b>		
1	$V_{FB}$	The $V_{FB}$ pin is the inverting input to the on-chip operational amplifier.
2	Filter	The Filter pin is the non-inverting input to the on-chip operational amplifier.
3	Signal Common	The Signal Common pin connects to $+V_S/2$ , to a 20k $\Omega$ resistor tied to $V_{FB}$ and to a 10k $\Omega$ resistor tied to Filter.
4	Gnd	The Gnd pin is the power return terminal
5	SCR Trigger	The SCR Trigger pin drives the silicon controlled rectifier during fault conditions. An internal 4.7k $\Omega$ resistor between this pin and Gnd holds the SCR off in non-fault conditions.
6	$+V_S$	The $+V_S$ pin is the power input to the IC.
7	Amp <sub>OUT</sub>	The Amp <sub>OUT</sub> pin is the output of the on-chip operational amplifier.
8	Detect	The Detect pin is the fault detector input.

Package Specification

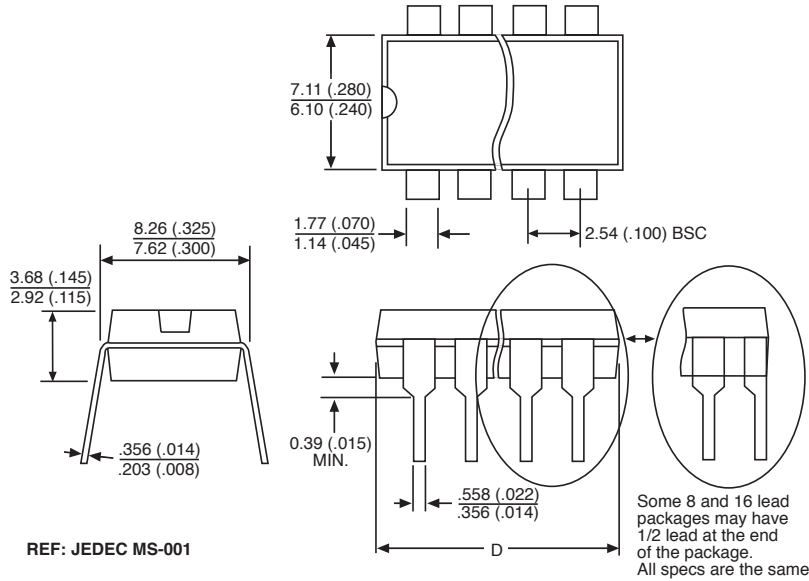
PACKAGE DIMENSIONS IN mm (INCHES)

Lead Count	D			
	Metric		English	
	Max	Min	Max	Min
8 Lead PDIP	10.16	9.02	.400	.355
8 Lead SO Narrow	5.00	4.80	.197	.189

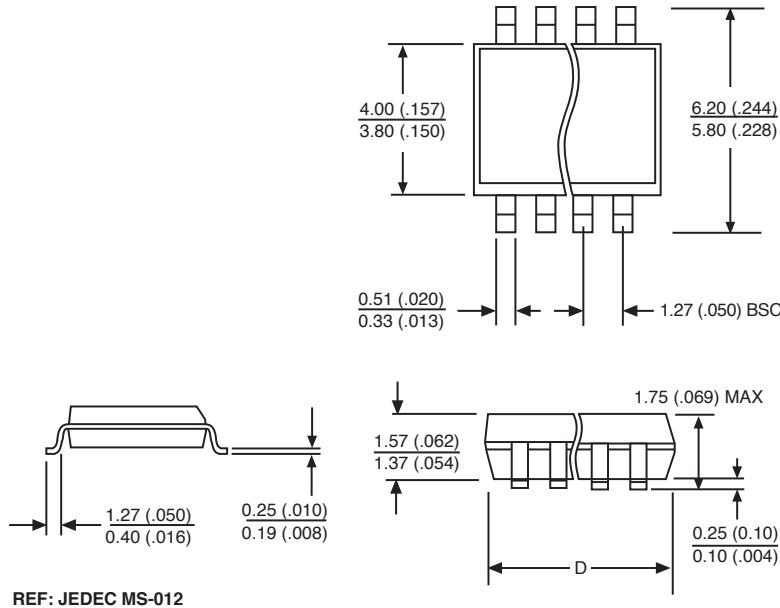
PACKAGE THERMAL DATA

Thermal Data		8 Lead PDIP	8 Lead SO Narrow	
R <sub>θJC</sub>	typ	52	45	°C/W
R <sub>θJA</sub>	typ	100	165	°C/W

Plastic DIP (N); 300 mil wide



Surface Mount Narrow Body (D); 150 mil wide



Ordering Information

Part Number	Description
CS294GN8	8 Lead PDIP
CS294GD8	8 Lead SO Narrow
CS294GDR8	8 Lead SO Narrow (tape & reel)

Cherry Semiconductor Corporation reserves the right to make changes to the specifications without notice. Please contact Cherry Semiconductor Corporation for the latest available information.